TOTAL MAXIMUM DAILY LOADS FOR METALS
LOS ANGELES RIVER AND TRIBUTARIES
APPENDIX III

COST SUMMARY - Infiltration Trenches and Sand Filters

	Infiltration Trench Construction	Infiltration Trench Maintenance ($ mill/year)	Austin Sand Filter Construction	Austin Sand Filter Maintenance ($ mill/year)	Delaware Sand Filter Construction	Delaware Sand Filter Maintenance ($ mill/year)	Total Construction Costs ($ million)	Total Maintenance Costs ($ million)
EPA	538	108	547	27	325	16	1410	151
FHWA	514	NR	101	NR	414	NR	1028	
Caltrans	4,997	90	4792	57	9180	116		

Assumptions

40% of the urbanized portion of the watershed to be treated with structural BMPs.
20% treated by infiltration trenches and 20% treated by sand filters.

Urbanized portion of LA River Watershed is assumed to be 462 sq miles or 295,680 acres (1 acre = 0.0015625 square mile)
The Los Angeles River Watershed is 834 square miles. The Angeles National Forest comprises 250 square miles of the watershed. The remaining 584 square miles of the watershed is incorporated cities or unincorporated portions of Los Angeles County. Open space comprises 112 square miles and water comprises 10 square miles of the incorporated cities and unincorporated County areas. The remaining 462 square miles can be considered the urbanized portion of the watershed.

Total area to be treated:

Infiltration trences:	**59,136**	(urbanized portion of watershed multiplied by 20%)
Sand filters:	**59,136**	(urbanized portion of watershed multiplied by 20%)

Low FHWA estimate of Austin Sand Filter cost was reported based on a drainage areas > five acres.

Cost of Caltrans Infiltration trench includes biofiltration strip pretreatment.

EPA and FHWA Infiltration Trench Cost Estimates

	FHWA*					EPA **			
BMP	Cost per device	Number of acres served	Number of Devices Needed	Total FHWA Construction Cost	Cost per device	Number of acres served	Number of Devices Needed	Total EPA Construction Cost	EPA Estimated Maintenance $/year
Infiltration Trench	$ 43,439	5	11,827	$ 513,757,954	$ 45,489	5	11,827	$ 538,007,501	$ 107,601,500

Urbanized portion of LA River Watershed is assumed to be 295,680 acres
Total area to be treated = **59136** (urbanized portion of watershed multiplied by 20%)

***For FHWA Calculations: C = 1317.1V$^{0.63}$ per device** (Young et al., 1996, Schueler, 1987)

where, V = storage volume in cubic meters

Assume	**0.5**	**inches runoff**
	0.0127	meters runoff
	5	**acre drainage area**
	20235	sq meter drainage area
	1	runoff coeficient
Then, V =	257	cubic meters

1 acre = 4,047 square meter
1 inch = 0.0254 meter
1 cubic foot = .0283168 cubic meters

****For EPA Calculations: C = $5/ft^3** (SWRPC, 1991; Brown and Schueler, 1997)

C= $ 177 /m^3

Assume V= 257 cubic meters produced by 5 acre drainage area and 0.5 inches runoff

Size Constraints:

1300 square feet of trench bottom area is needed to treat 0.5 inches of runoff per acre.
For five acres: 6500 square feet of trench bottom area

Caltrans Infiltration Trench and Biofiltration Strip Cost Estimates

BMP	Drainage Area (acre)	Avg. Adjusted Const. Cost	Cost per Acre	Number Needed for urbanized portion of watershed	Total Construction Cost	Maintenance $/year
Infiltration Trench + Biofiltration Strip	1.7	$ 146,154	$ 84,495	34,188	$ 4,996,697,728	$ 90,221,857

Urbanized portion of LA River Watershed is assumed to be 295,680 acres
Total area to be treated = **59136** (urbanized portion of watershed multiplied by 20%)

SAND FILTERS COST ESTIMATES

From CalTrans BMP Retrofit Study

Filter Type	Drainage Area (acre)	Adjusted Const. Cost	Cost Per Acre	Number Needed for urbanized portion of watershed	Total Const. Cost Based on CalTrans estimate	CalTrans Estimated Maintenance $/year	EPA Const. Cost/ acre *	Total Const. Cost Based on EPA estimate	EPA Estimated Maintenance $/year	FHWA Const. Cost/ acre (< 2 acres) **	FHWA Const. Cost/ acre (> 5 acres) ***	Total Const. Cost Based on FHWA estimate (< 2 acres)	Total Const. Cost Based on FHWA estimate (> 5 acres)	FHWA Estimated Maintenance $/year
Austin	1.5	$ 203,484	$ 137,245	19943	$ 4,058,069,048									
Austin	1.7	$ 259,156	$ 149,824	17094	$ 4,429,999,166									
Austin	2.7	$ 314,346	$ 115,647	10878	$ 3,419,445,369									
Austin	2.7	$ 213,261	$ 78,458	10878	$ 2,319,846,090									
Austin	0.7	$ 223,748	$ 301,826	39886	$ 8,924,385,537									
Avg Austin	1.9	$ 242,799	$ 156,600	19736	**$ 4,791,817,904**	**$ 57,332,324**	$ 18,500	**$ 547,008,000**	**$ 27,350,400**	$ 16,000	$ 3,400	**$ 473,088,000**	**$ 100,531,200**	not reported
Delaware	0.7	$ 230,145	$ 310,455	39886	**$ 9,179,535,501**	**$ 115,868,477**	$ 11,000	**$ 325,248,000**	**$ 16,262,400**	$ 14,000	NA	**$ 413,952,000**	**NA**	not reported

Urbanized portion of LA River Watershed is assumed to be 295,680 acres

Total area to be treated = **59136** (urbanized portion of watershed multiplied by 20%)

Area to be treated by Austin Filters = **29568** (Half of the 20% to be treated by Austin)

Area to be treated by Delaware Filters = **29568** (Half of the 20% to be treated by Delaware)

*High end of EPA range (U.S. EPA 1999) used to estimate cost of Delaware ($6,600 - $11,000)

** Per impervious acre for facilities serving less than two acres.

*** Per impervious acre for facilities serving greater than five acres

(Construction cost estimates exclude real estate, design, and contingency costs. (Schueler, 1994).)

1 acre = 4,047 square meter

1 inch = 0.0254 meter

1 hectare = 2.47105 acres

Austin size constraints:

Full sedimentation design requires 100 sq feet to treat 0.5 inches of runoff per impervious acre

For 50 acre area: 5000 sq feet

Delaware size constraints (size and shape flexible b/c below ground):

Assume a storage depth of 3 ft.

Then 150 sq ft req'd for sediment chamber and 200 sq ft for sand filter area to treat 0.5 inch runoff per impervious acre

For 50 acre area: 17,500 sq feet